Daily Times
Trending: Kashmir Coronavirus Your right to know ePaper
HOME LATEST PAKISTAN WORLD EDITORIALS & OPINIONS BUSINESS SPORTS ARTS, CULTURE & BOOKS LIFESTYLE E-PAPER

JULY 25, 2021

Chemistry is the invention of the Muslims

Zafarullah Khan

As a science, Chemistry is unquestionably the invention of the Muslims. It is the science to which Muslims have made the greatest contributions and developed it to a high degree of perfection. Because of their discoveries and understanding, they were considered the authorities of this science until the end of the 17th century. Al-Jabr Ibn Hayyan and Zakariya Razi have the distinction of being the greatest chemists the medieval times produced.

Al-Jabr Ibn Hayyan, called Geber (d. 815), who flourished in Kufa, is known as the father of modern chemistry. He believed that all matters could be traced to a simple, basic particle composed of a lightning-like charge and fire, which serves as the smallest indivisible unit of matter. He discovered as many as 19 elements and is credited with the correct measurements of specific weights. He perfected chemical processes such as distillation, crystallization, and sublimation. He was also the first to distill vinegar into acetic acid, to introduce the relative solubility or insolubility of substance in solutions, and the first to use glass tubes, and bottles on a large scale. He laid great emphasis on experimentation in his research.

He explained scientifically the two principal operations of chemistry, calcination (heating to high temperatures in air or oxygen) and reduction) or part of a reduction-oxidation reaction in which atoms have their oxidation state changed), and registered a marked improvement in the methods of evaporation, sublimation (transition of a substance directly from the solid to the gas phase without passing through the intermediate liquid phase; it is an endothermic phase transition that occurs at temperatures and pressures below a substance's triple point in its phase diagram; the reverse process of sublimation is de-sublimation or deposition, in which a substance passes directly from a gas to a solid phase) filtration, distillation and crystallization. Science historian E.J. Holmyard (1931), makes the following observation in his book Makers of Chemistry: Jabir seeks to understand the changes that take place during the processes, besides giving opinions to their aims; for instance,

explaining how the aim of calcination is to remove impurities from metals, and how metals are calcinated in different ways.

Al-Jabr described the preparation of many chemical substances including Cinnabar (sulfide of mercury) and arsenic oxide. He prepared mercury oxide and was fully conversant with the preparation of crude sulfuric and nitric acids. His chemical treaties on such subjects have been translated into several European languages including Latin, and several technical scientific terms invented by al-Jabr have been adopted in modern chemistry. Al-Jabr also advanced a theory on the geologic formation of metals and dealt with many useful practical applications of chemistry such as the refinement of metals, preparation of steel, dyeing of cloth and leather, varnishing of cloth to make it waterproof, and the use of manganese dioxide to color glass. He also gives recipes for making inexpensive illuminating ink for manuscripts and mentions the use of manganese dioxide in glass making.

Al-Jabr built a precise scale that weighed very tiny items. He defined chemical combinations as a union of the elements together, in particles too small for the naked eye to see, without loss of their character preceding John Dalton (d. 1844-was an English chemist, physicist, and meteorologist. He is best known for his pioneering work in the development of modern atomic theory) by ten centuries. He identified many new products, including alkalines, acids, salts, paints, and greases. He prepared sulphuric acid, nitro-hydrochloric acid (used to dissolve some metals), caustic soda, and a multitude of salts such as sulphates, nitrates, potassium, and sodium carbonates. Jabir's work with metals and salts subsequently helped develop foundry techniques and glazing processes for tiles and other ceramics.

Nearly a century after Jabir, Al-Razi (d. 925), developed foundations of chemistry that served in that capacity until modern times. In his work Secret of Secrets, he presented the very useful classification of natural substances, dividing them into earthly, vegetable, and animal substances, to which he also added a number of artificially obtained substances such as lead oxide, caustic soda and various alloys. He went further in the cataloguing and description of his experiments, describing first the materials he used, then the apparatus, methods, and conditions of his experiments. Al-Razi

also set up the laboratory in the modern sense, designing, describing, and using more than twenty instruments.

Al-Majriti (d. 1007), an Andalusian scholar from Madrid, is noteworthy mainly due to his work Rutbat Al-Hakim (The Rank of the Wise), which amongst other things, gives formulae and instructions for the purification of precious metals. In this work, Al-Majriti was also the first to mention the idea of mass conservation, an important discovery made eight centuries before Lavoisier (d. 1794- a French nobleman and chemist who has a large influence on both the history of chemistry and the history of biology. He is widely considered in popular literature as the 'father of modern chemistry.' He discovered that, although matter may change its form or shape, its mass always remains the same).

From the above mentioned few examples, one can safely infer that the Muslim made great strides in the advancement of Chemistry, making it an independent disciple in Science away from Alchemy.

(Writer is a former SAPM/Minister for Law and Justice and a practicing Barrister and writer: mail@zafarullahkhan.com)